TECHNICAL AND SERVICE

MANUAL

(Romania)

CONTENTS

1 Technical characteristic.

Voltage:	
	220V AC/7.1V DC power supplier DC power battery: 6V 3.2AH
Approximately power consumption	5W
Idle power consumption	30mW
Peak current	6A
Sleep mode current	0.5mA
Permissible work temperature	-10°C~+40°C
Data base memory	CMOS RAM
Printing mechanism	
Thermal printer	TP201
Paper	Receipt roll (2x28 mm)

2 Operational conditions

1. The cash register shall be operated without direct sunlight, in the ambient temperature of more than -10°C and less than +40°C.
2. The cash register shall be connected to a PSU (Power Supply Unit) supplied by the producer (220V AC 50HZ) or to an internal battery (6V for the thermal printer version).
3. The cash register shall be operated in dust-free and dry rooms (working under high dust concentration conditions reduces the mechanism's life).

3 General description

The cash register has an RS232 serial interface. With which you can connect it to an external computer or an external barcode scanner.

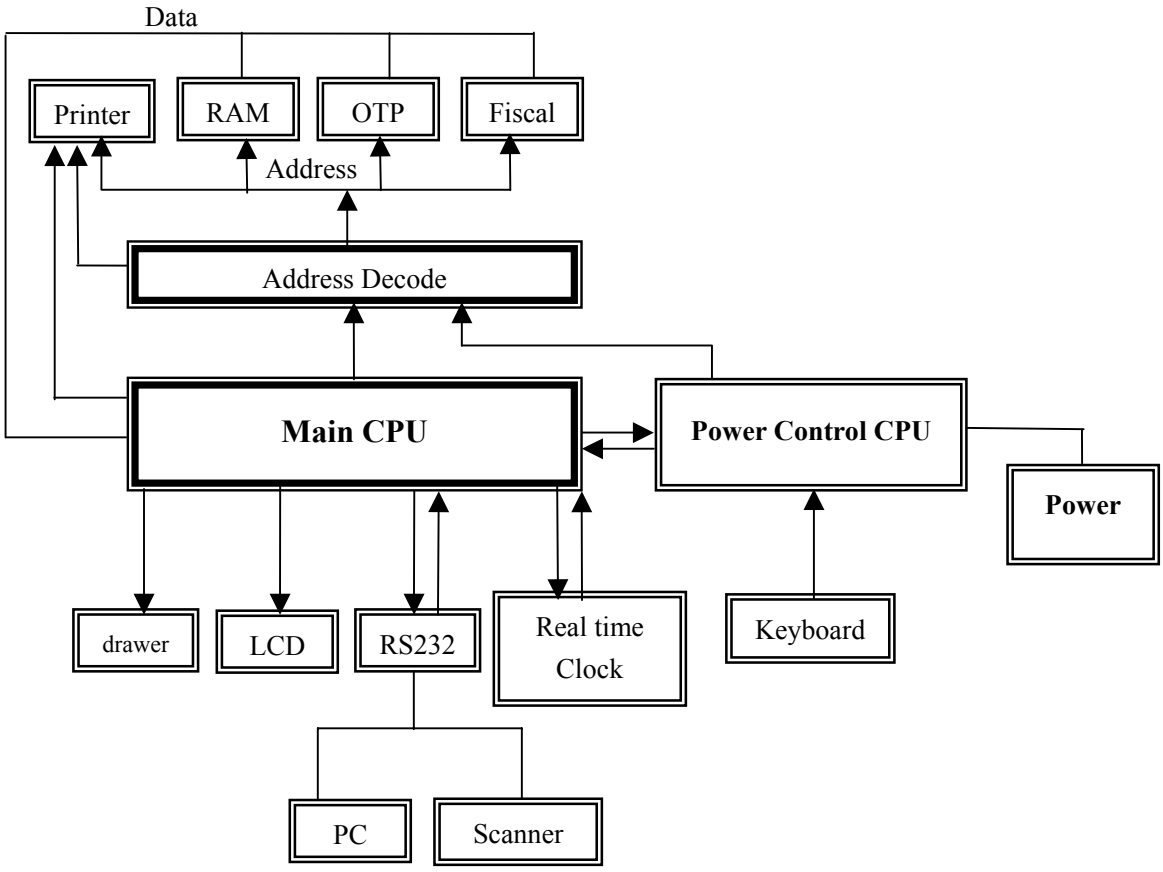
The device is made up of one electronic module for controlling all the cash register function: the keyboard control, the LCD display (customer and client), printing mechanism (thermal), the drawer, OTP-type fiscal memory and real time clock, It allows for the communication with an external computer, a barcode scanner.

It is also provided with software. Which is a pure Win32 program, and must run in Windows 98. The software provides the cash register data (including PLU goods and Department information) manage. It allows for data and Report (including X and Z report, Fiscal report, Clerk report,X2 and Z2 report) to be uploaded from the cash register.

The LCD display is capable of displaying 6 characters and 8 digits. It rolls long message from right to left with the message showing length increasing.

4 Details

4.1 The structure diagram



4.2 Power supply

The device has a build-in battery (6V for a thermal printing mechanism) or may be connected to an external PSU (220V AC 50HZ) with the battery charging operation. When the external PSU is connected and switched on, the battery is charged automatically, no matter whether the cash register is operating or not. The cash register may also be operated when the battery is being charged. The charging time is unlimited, which means that the cash register may be connected to the PSU all the time.

When printing job is over and no key is pressed for a long time, the device will shut power-consuming component and go into sleep mode until one key is pressed or communication starts.

4.3 Architecture: a brief description of functional blocks

Main board power input is 7.1V DC. It offers printing driver and motor driver. With DC-DC 24V is used to control drawer, and 13V is used as Fiscal-Memory program voltage. 5V supply working voltage of system.

Main CPU connects 128K RAM and 512K OTP ROM. The first 32K RAM is used for temporary variable, and the other is data area. The first 64K ROM is program area, and the other is data area.

The second CPU is EM78P451. It is responsible for monitoring Main CPU, Data protection, Fiscal Memory protection, keyboard scanning and power controlling.

Thermal printing mechanism is APS MP-205.

Fiscal Memory can be written only once. It can not be removed while working. When it's removed, the device will detect it and halt itself.

The RS232 is controlled by Main CPU and the highest baud rate is 115200. When the distance is increased, the baud rate must be decreased.

The Real Time Clock IC. It can take count of year, month, day, hour, minute, second and leap year. The cash register can access and set up the real time clock.

A LCD appropriative driving IC takes charges of it and it has backlight controller.

4.4 Interfaces: the terminals

CN-IC:The fiscal memory connector

Jumper: J2A,J2B

27C010,27C020,27C040: J1A:Off J1B:Off J2A:On J2B:On

1	VPP1		0V:Read-out, +13V:Programming
2	PRG-VCC		5V:Read-out, +6V:Programming
3	AA16		FM(Fiscal Memory) Address
4	AA18		
5	A15A		If FM is 27C256 VPP else AA15
6	A17A		If FM is 27C256 PRG-VCC else AA16
7	AA12		
8	AA14		
9	AA7		
10	AA13		
11	AA6		
12	AA8		
13	AA5		
14	AA9		
15	AA4		
16	AA11		
17	AA3		
18	PRGOE		Output Enable Low: Read High :Program
19	AA2		
20	AA10		
21	AA1		
22	PRGCS		Chip Enable Low: Enable High: Disable
23	AA0		
24	DD7		FM data
25	DD0		
26	DD6		
27	DD1		
28	DD5		
29	DD2		
30	DD4		
31	GND		Gnd
32	DD3		
33	LOOP1	Out	With Pin34, Check if FM is installed or not.
34	LOOPCHK	In	

CN101: Keyboard connector

1	Loop2		Loop with Loop1 to detect keyboard is installed
2	K0	Out	Row 0
3	K1	Out	Row 1
4	K2	Out	Row 2
5	K3	Out	Row 3
6	Key2	In	Column 0
7	Key3	In	Column 1
8	Key4	In	Column 2
9	Key5	In	Column 3

10	Key6	In	Column 4
11	Key7	In	Column 5
12	Key8	In	Column 6
13	Key9	In	Column 7
14	K4	Out	Row 4
15	Loop1		Loop with Loop2

CN102: EPM3032ALC44 programming connector

1	+3.3V		Power
2	ISP-TDI	Out	Data output
3	ISP-TDO	In	Data input1
4	ISP-TCK		Clock
5	ISP-TMS	In	Data/Command input
6	GND		

CN103: LCD Display connector

1	LOOP3		
2	LUMI		
3	KDAT/LIT		
4	LCD-CLK		
5	LCD-DAT		
6	P2S-LD		
7	LCDWKLP		
8	VDD-LCD		
9	LCD-CS		
10	GND2		

JH1: MP205 connector

1	PRN-PS		
2	VPS2		
3	GND		
4	+BAT2		
5	+BAT2		
6	PRNDAT		
7	PRNDSS3		
8	PRNDSS4		
9	PRNDSS3		
10	PGND		
11	PGND		
12	PGND		
13	PGND		
14	PRN-TH2		
15	PRNDST4		
16	PRNDST3		
17	PRNDST4		
18	M+5V		
19	PRNCLK		
20	PRN-LH2		
21			
22	BAT2		
23	BAT2		
24	/PRN2B		
25	/PRN2A		

26	PRN2B		
27	PRN2A		

CN203: Drawer connector

1	P+20V		
2	Drawer	Out	
3	Gnd		
4	Draw-Sw		

CN202: Power

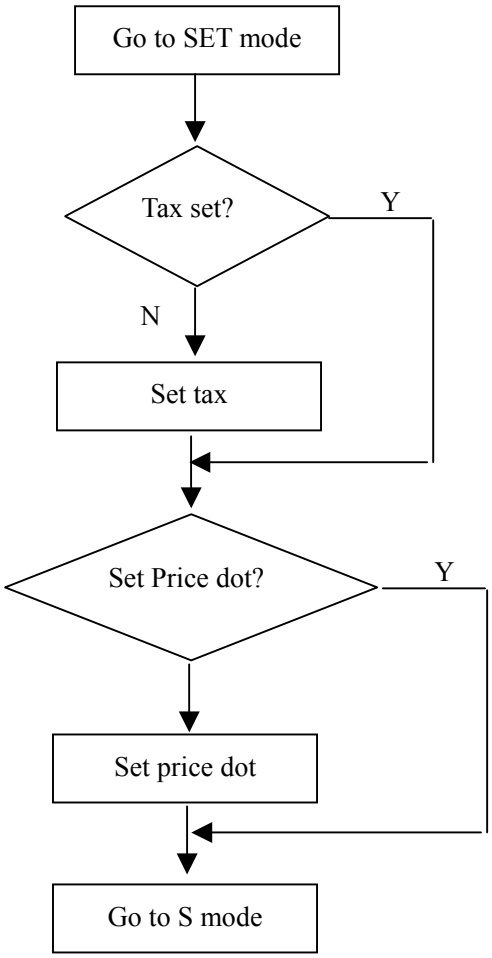
1	+BAT		
2	PGND		
3			

CN1: RS232 Interface (PHONE6)

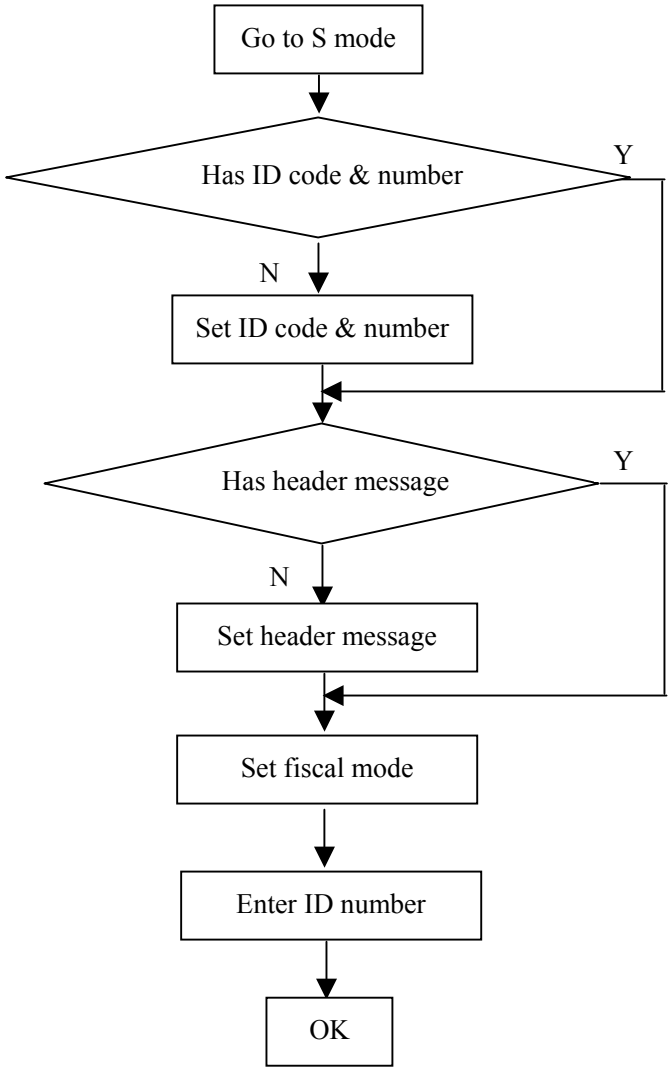
1	CTS		
2	+5V		
3	GND		
4	RXD		
5	TXD		
6	RTS		

5 Service information

5.1 Fiscalization (Replace of Fiscal memory)



1. Use [KSW/CLERK] key to select S mode
2. Input S mode password, then press [TOTAL] to enter S mode
3. Use [-%],[+%] key to select ‘Set ID Code & Number’, then press [TOTAL] key
4. According to the prompt, Input ID Code (2 characters, use [-%],[+%] to change character, For example, input ‘AB’ and press [TOTAL]
5. According to the prompt, Input ID Number (10 digit), then press [TOTAL] key to set. For example, input ‘1234567890’ and press [TOTAL]. According to the prompt, you will be asked to confirm the ID Code &number you entered. Select 1:Yes or 2:No.
6. Use [-%],[+%] key to select ‘head message set’, then press [TOTAL] key
7. according to the prompt, input the line you want to edit, then press [TOTAL], according to the prompt, input the message no more than 24 characters. You must set the five-line head message, or you can’t enter fiscal mode.
8. Use [-%],[+%] key to select ‘Fiscal mode setting’, then press [TOTAL] key
9. According to the prompt, input ID number which is set before, then press [TOTAL] key



After the steps, the configuration of ECR is as followed.

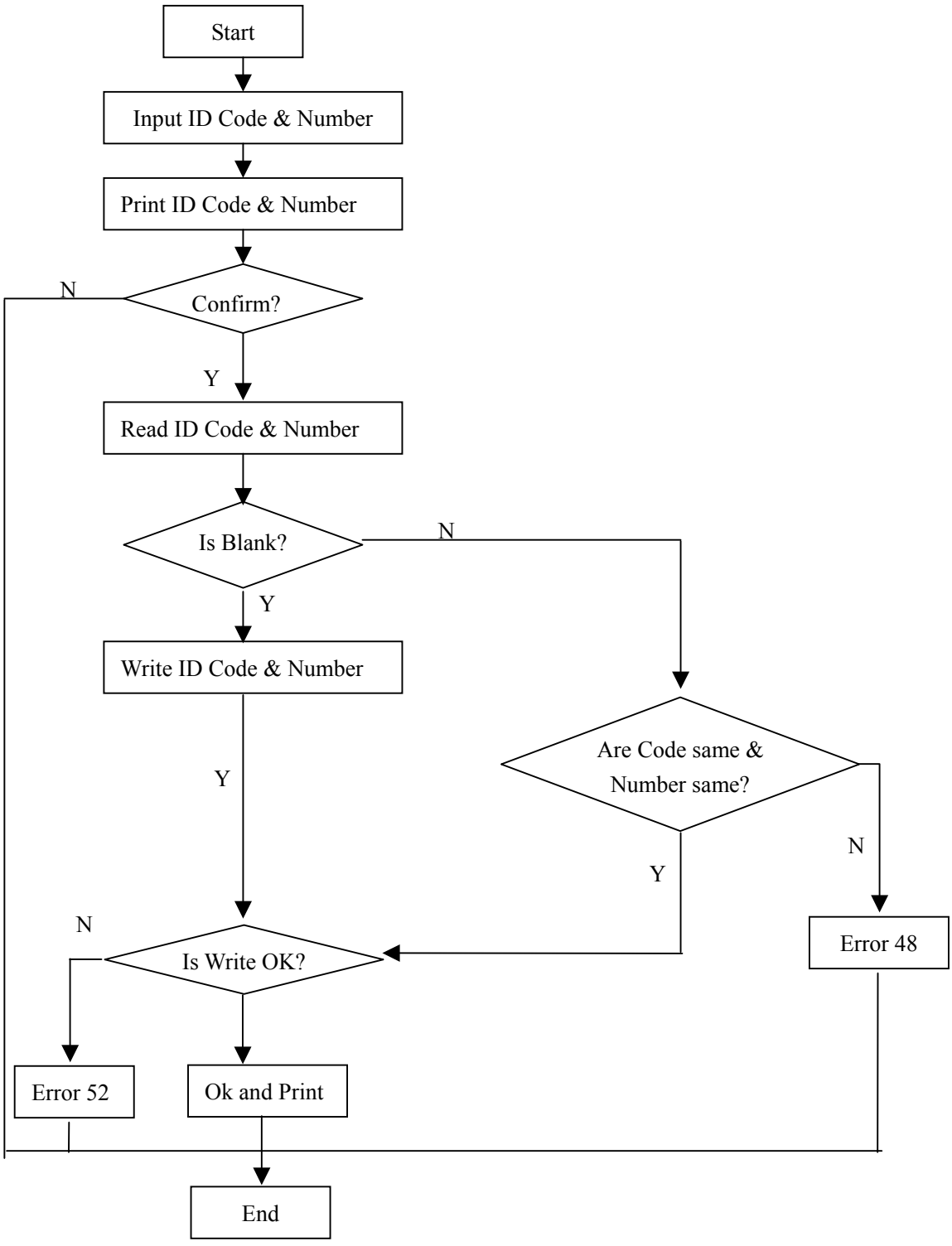
ID Code and Number AB 1234567890

Note:

1. *ID Code & Number must be setup before Fiscalization*
2. *Header message must be set up before fiscalization.*
3. *Tax and price dot must be set*

5.2 ID Code and Number

According to the layout of Fiscal Memory, refer to "Map Of Fiscal Memory', ID Code and Number are placed at 1FFD8—1FFE3. Just before setting ID Code and Number, the s/w will read the 12 bytes first, check if they are the same as set or all blank (value FF mean blank), if not blank, and Code Number is not the same, then error 48 occur. After set ID Code and Number, the s/w will read again to make sure it's be written correctly, if not correct Error 52 will occur.



5.3 ECR Reset and Recovery

1. Use [KSW/CLERK] key to select S mode, then press [TOTAL] key
2. Input S mode password, press [TOTAL] key
3. Use [-%],[+%] key to select 'ECR reset', then press [TOTAL] key.
4. Use [-%],[+%] key to select 'Recovery', then press [TOTAL] key
5. Input Time (format HHMM, HH:Hour00-24, MM:Minute00-59), press [TOTAL] key
6. Input Date (format DDMMYYYY. DD: Day MM: Month, YYYY: Year), then press [TOTAL] key

Note:

1. After ECR reset, Recovery must be done. Otherwise, Fiscal error will appear.
2. Recovery will restore Z-Counter ,sale-total and tax total from Fiscal.

5.4 Power Saving and CPU monitor

Battery or external power supply unit can supply this device. When the external power supply unit is connected and switch on, the automatic battery charging begin, no matter whether the cash register is turned on or not. It means that that battery can be charged for any time duration.

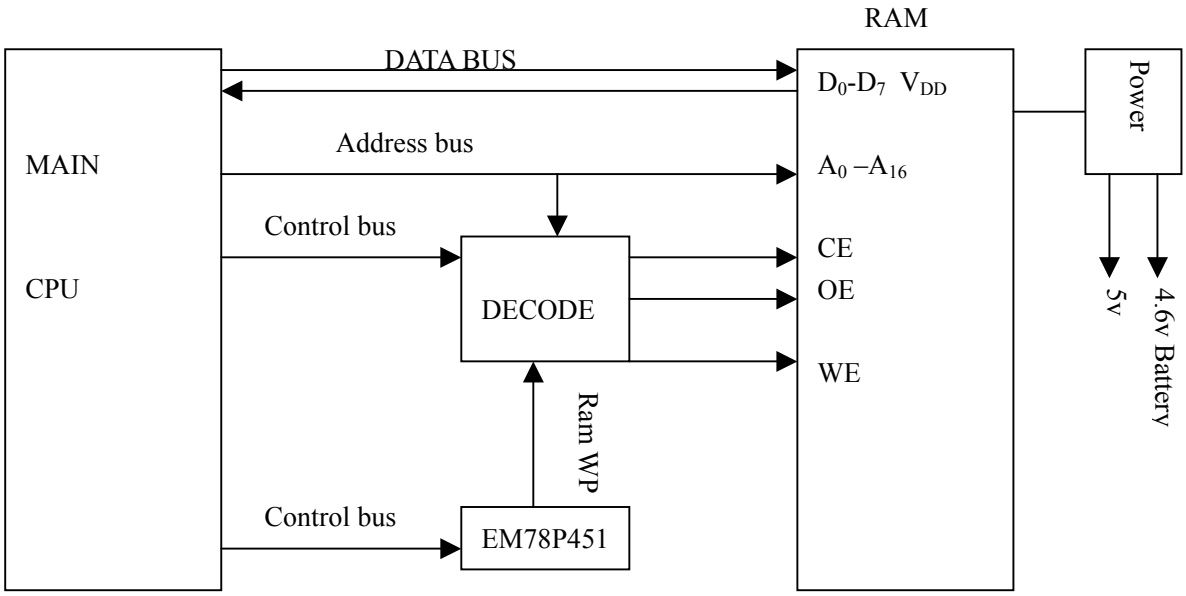
When lack of external voltage, the battery supply begin. In idle mode, the main CPU, EPM3032ALC44, 29C020 will consume a lot of energy. It will exhaust the battery energy. So power saving here is very important. In both power supply, since the end of a printout if no key is pressed for 1 minute, main CPU will inform the second CPU that it's idle now, the second will turn the power off and then go into sleep mode. When one key is pressed or communication start, the second CPU will wake up and turn the power on automatically.

Main CPU will communication with the second CPU per 10 ms. If the communication between two CPU disappear for 2 second, main CPU may run abnormally, the second CPU will reset main CPU.

5.5 Data protection (Ram, Fiscal-Memory, OTP ROM)

DESCRIPTION OF RAM PROTECTION(15X)：

1. Correlative circuit frame drawing as have been showed below:



2.We can learn clearly from the frame drawing that there are two ways about RAM protection.

3.When we do the writing operation, it is needed that the main CPU cause EM78P451 RAM disable the writing protection, and then it can be operated the writing data operation to RAM.

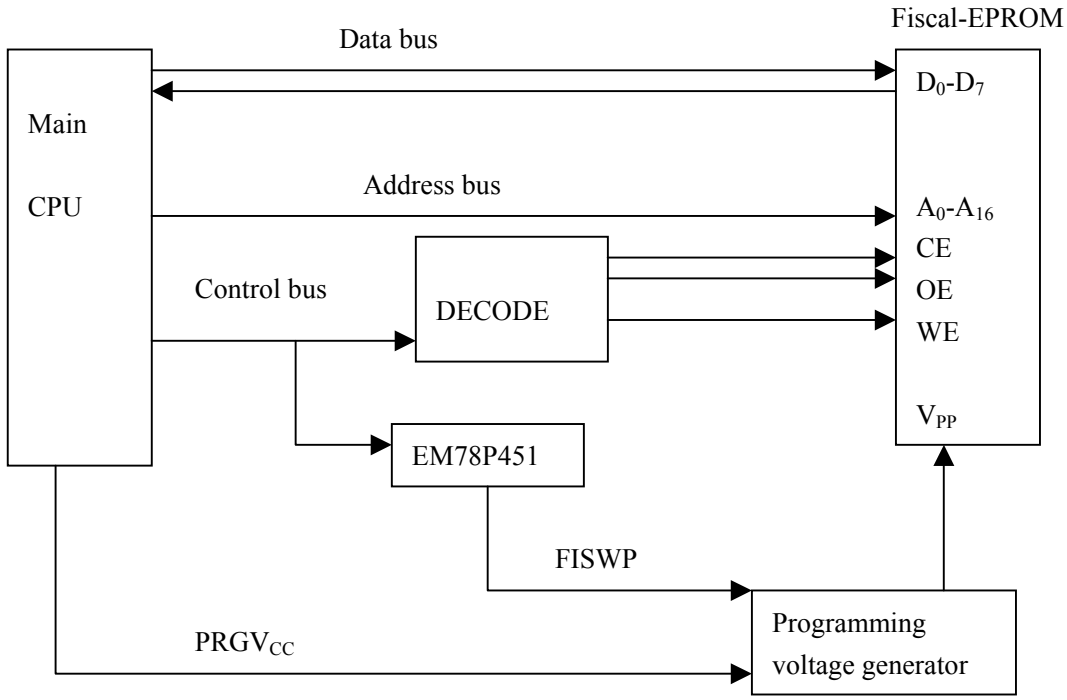
4.After this, main CPU order the writing data protection valid about EM78P451RAM. So we can conclude that there are two ways to protect the RAM writing operation, in case that programmer of main CPU run out, the data still can be protect very well and avoid destroy because of the double protection

5.In another hand, we can learn from the drawing that when the power is turned off suddenly (mean no 5v power now), it can be supplied by the standby battery in order to protect the RAM data.

Synthetically adopt the above method, we can protect the RAM data reliably.

DESCRIPTION OF PROTECTION OF FISCAL MEMORY (15X)

1. Correlative circuit frame drawing showed as below:



2.As we know Fiscal-Memory data is very important for ECR, as if appeared invalid writing it maybe cause serious effect, so we have pay more attention about the protection of Fiscal-memory data.

When process the writing operation to Fiscal-memory, programming voltage generator needs to be output. While its output must be ordered by main CPU, which made Fiscal-memory of EM78P451 disable. More addition, valid of $PRGV_{CC}$ of main CPU allow V_{PP} output programming Voltage generator, then main CPU orders to process writing protection for Fiscal-memory according to the programming. After that main CPU orders Fiscal-memory protection of EM78P451 enable.

According to the above it needs to output V_{PP} programming voltage generator in order to write the data into Fiscal-memory. Because V_{PP} programming voltage generator has double protections by main CPU and EM78P451, that ECR can protect Fiscal-memory data not to be invalid effectively.

5.6 Power down process

Check power failure at the power terminal. If power failure happens, an interrupted signal will be send to CPU, then CPU will conduct the following process:

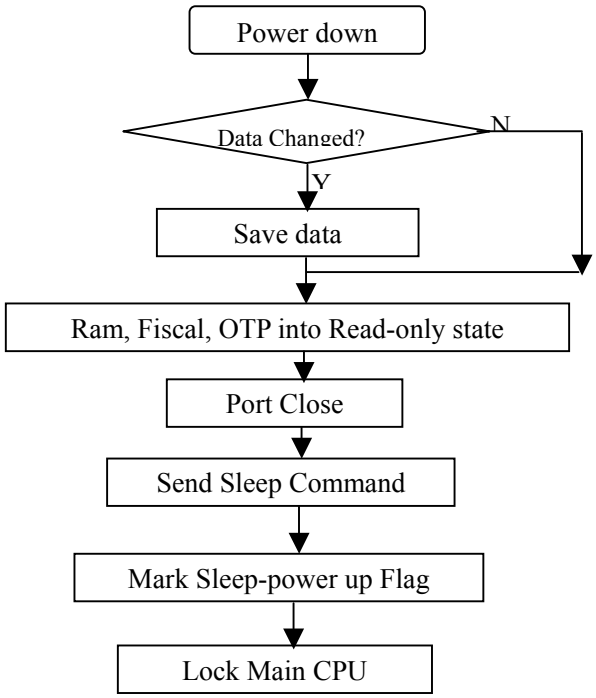
a. Switch the peripheral I/O to power save mode.

b. Backup system register to the external RAM

c. CPU go into power down state. Waiting for reset.

d. If system resumes power supply halfway. After RESET, I/O will be initialized and return to the last working status.

Note: In normal working state, RAM's Chip Select is powered with 5V. When power failure, the voltage decrease to 4.6V. Then RAM's Chip Select will enter Disable mode. Such action can prevent RAM from missing. And CPU will be forced to RESET state, this prevent RAM from being affected by CPU execution.



5.7 Power up Initialization

a. Stack set, Stack Pointer = 0xA0
b. Initialize Port
c. Timer set
d. Serial Initial. Baudrate = 9600, No parity, Stop Bit = 1
e. Working memory clear
f. Check the checksum of program.
g. If the checksum is ERROR then wait for program update from PC.
h. Restore backup data
i. Check the RAM data
j. If RAM data is invalid then clear Data memory
k. Recovery, restore data from Fiscal memory
l. Go to main loop

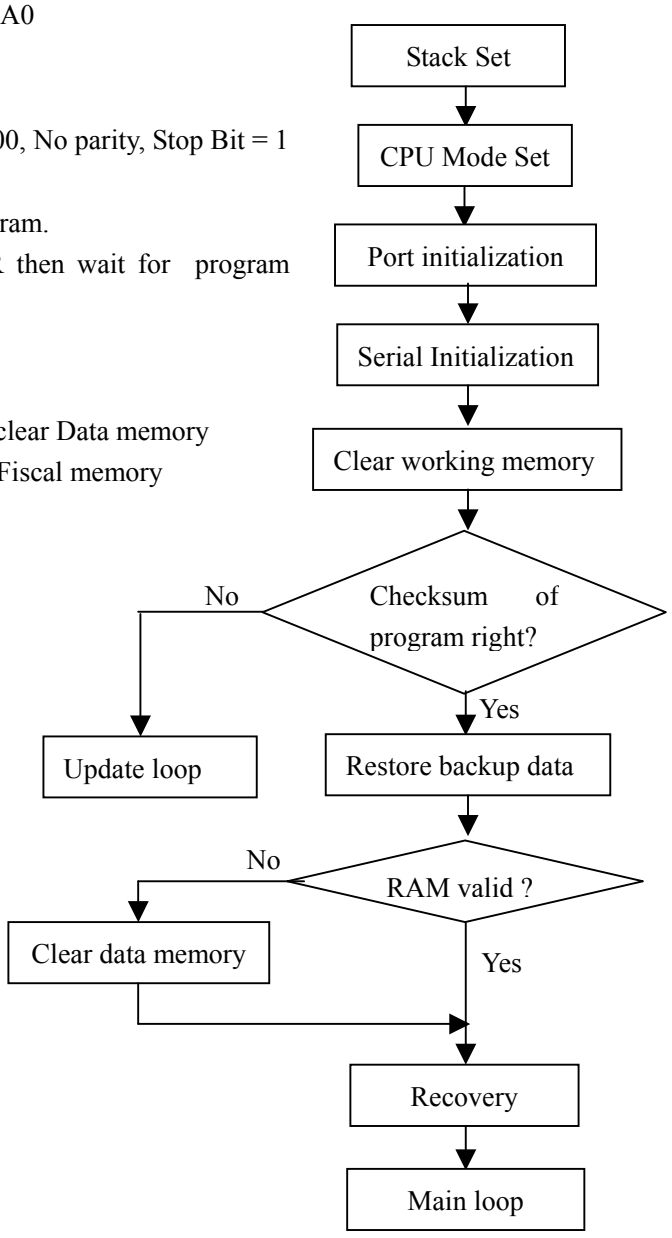
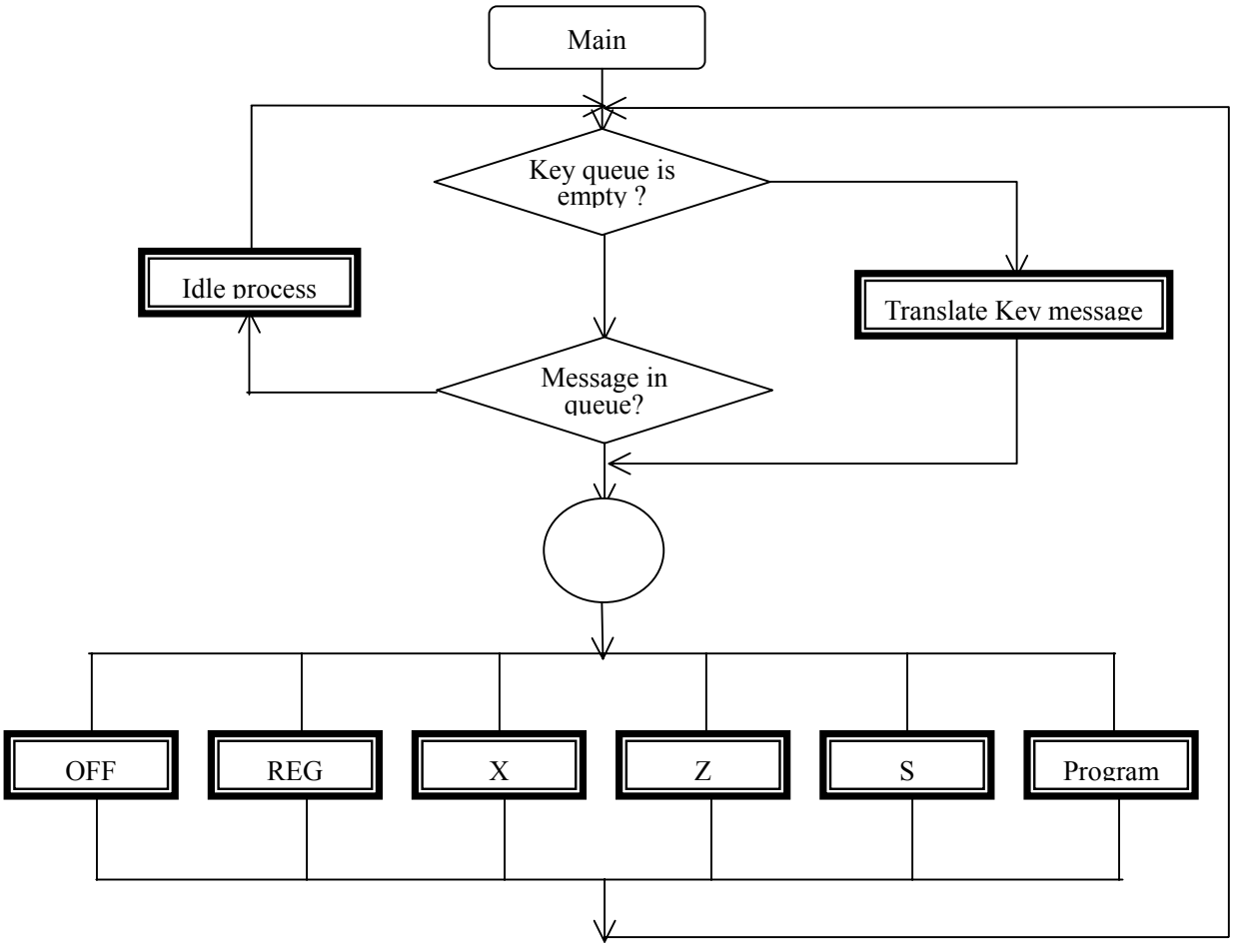


Fig. Program Reset

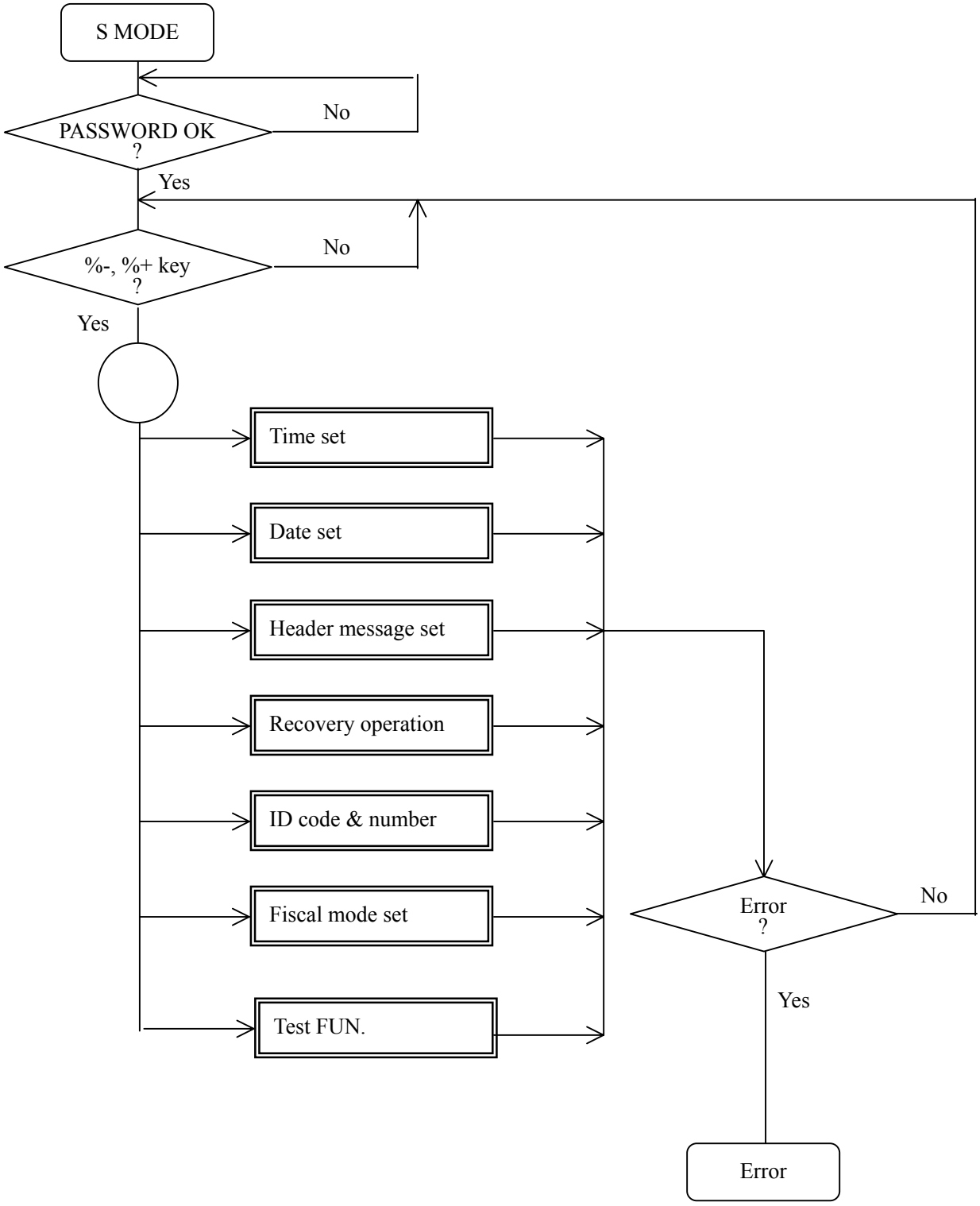
5.8 Main Loop

The device program is a software which bases of message mapping mechanism. The time is separated by the software. The device scans the keyboard per 10ms and refresh LCD per 100ms etc. The main loop just peek the message and translate the message, then handle the message. Only one message is handled every loop. If no keyboard is in queue and message buffer is empty, it is regarded as idle. In idle state, system is checked in sequence. In another word, Fiscal memory, keyboard, display, ram, printer… will be checked by order. If any device is wrong, Exception is raised, waiting operator to handle.

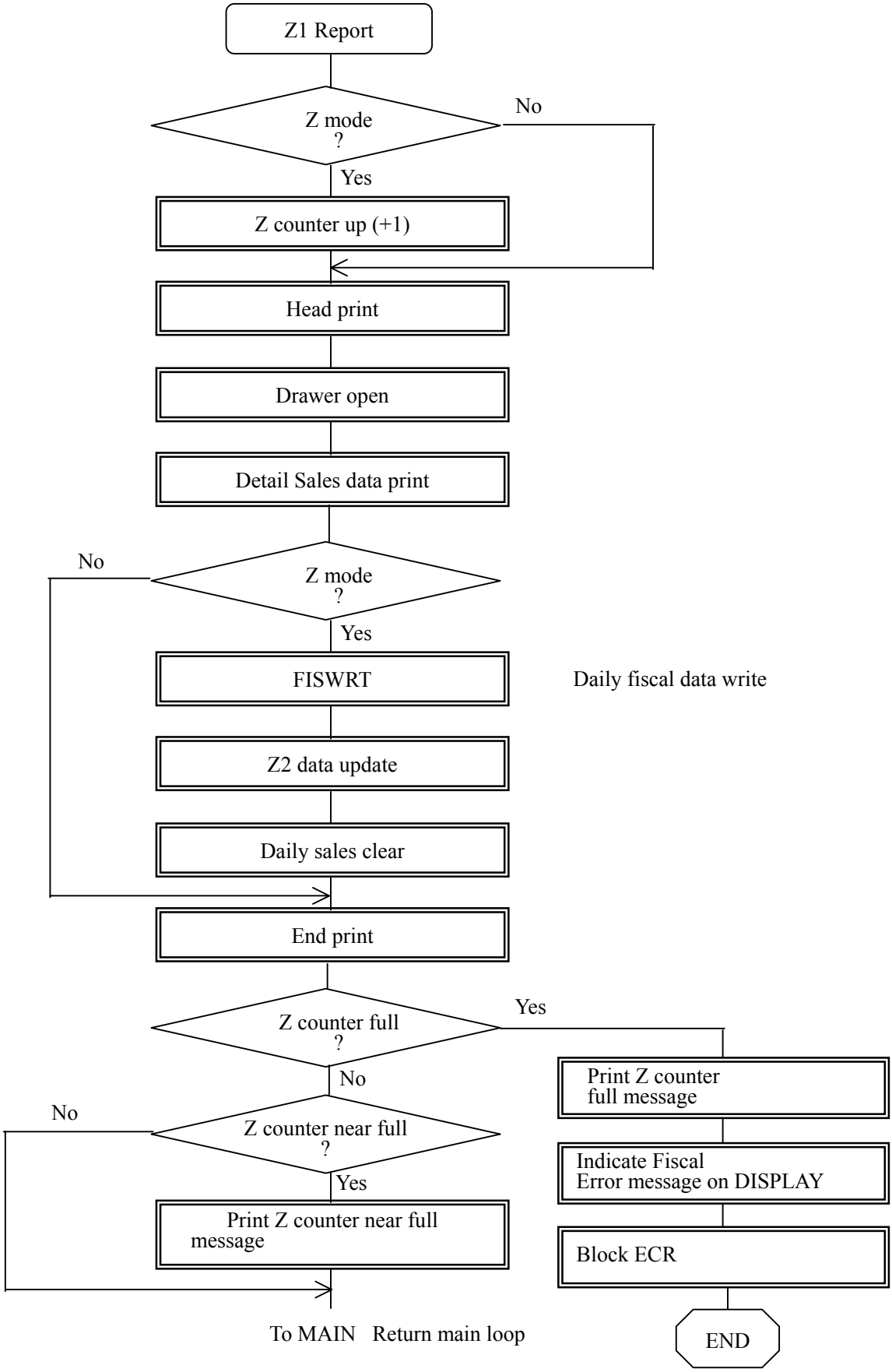


Main Loop

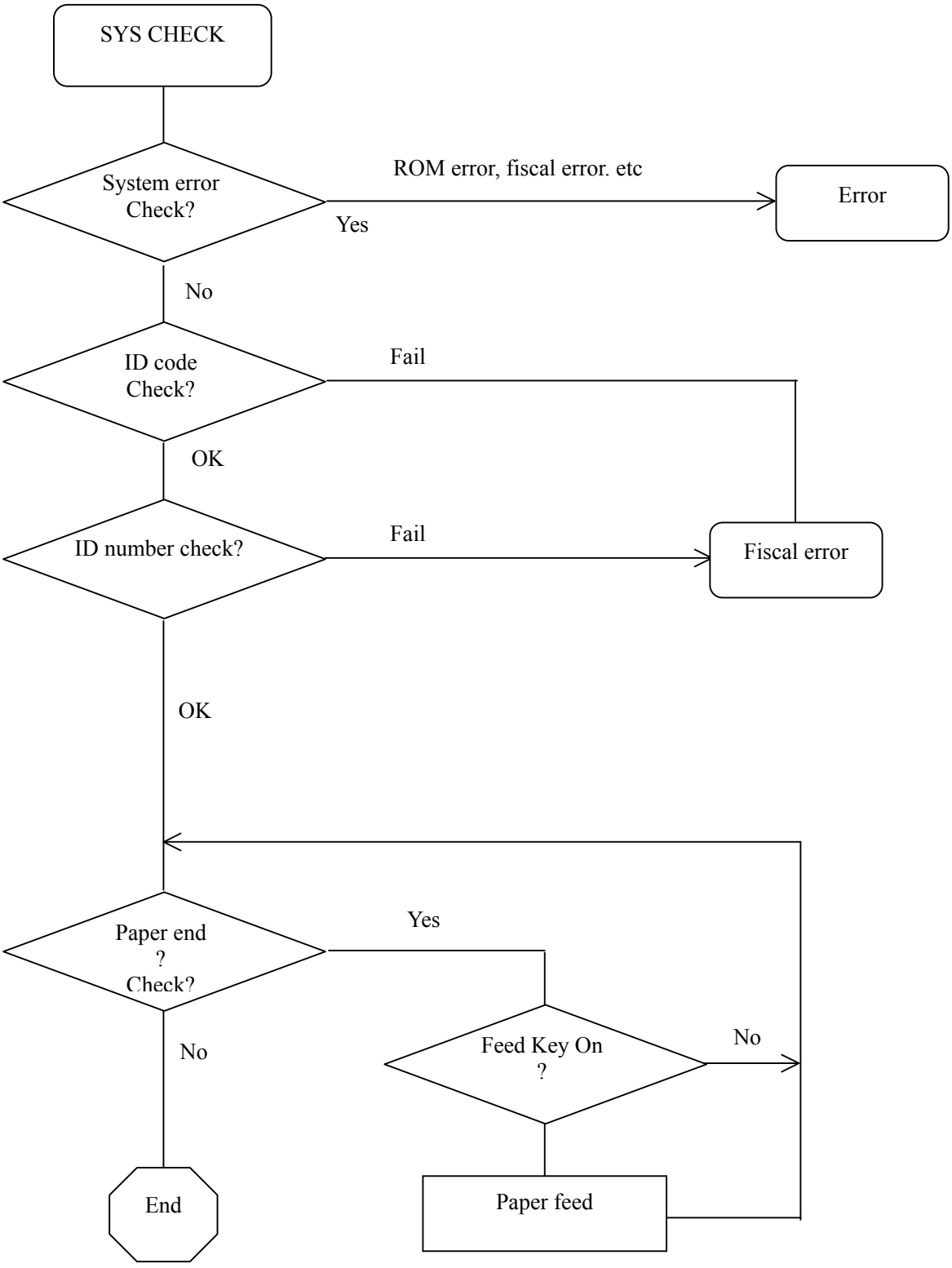
5.9 S Mode Function



5.10 Z Mode Function



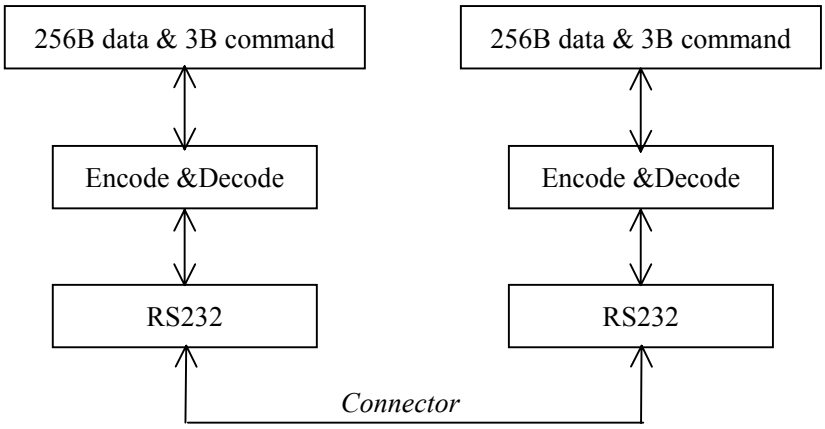
5.11 Error Check



5.12 Communication protocol

The device adopts RS232 as its physical layer protocol with 115,200 as its highest baudrate. With distance increased, the communication baudrate should be decreased. The default baudrate is 9,600 no parity 1 stop bit.

There are three layers communication layer here. The bottom is RS232, the second is data-link-layer, the top is application-layer. The bottom layer provides a cheap and high-reliability physical layer. The data-link-layer make sure the data between computer and the cash register correctly transferred. The top layer use 256 bytes data and 3 bytes command as basic unit. In other word, the length of package is fixed at 259 bytes.



Communication Layer

The computer and the cash register has a relation of principal and subordinate. The computer is principal and the cash register is subordinate. Every communication is originated by the computer. The computer sends out a “connecting” command. In “connecting” command, the communication of this time is included. If connected, data transferring between the computer and the cash register is allowed. At the end of communication, “Disconnecting” command is sent from the computer. The cash register will reset the baudrate to 9,600 and stop the communication.

When the cash register has account and has been not committed yet. The communication is allowed. The cash register will send “not allowed” to the computer.

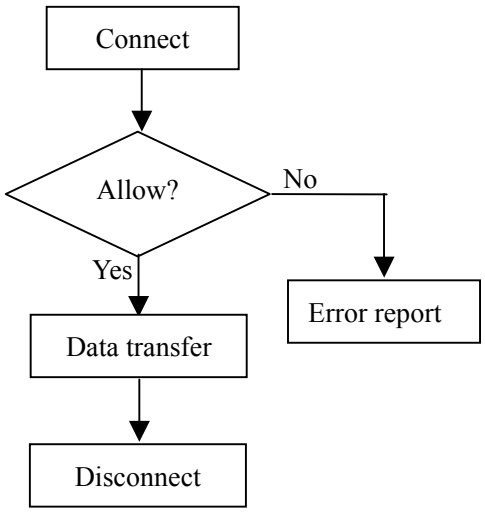


Fig Communication

6 Error Message

6.1 Familiar Error Information

Format of familiar error information is ERR X

Error code and description

Error number	description
01	this function key can't use in X, Z, SET, S mode
02	ECR can't work without input clerk code
03	digit input error
04	clerk no.invalid
05	quantity invalid
06	prohibit to correct
07	prohibit discount
08	prohibit +%
09	prohibit -%
10	prohibit void
11	press price key invalid
12	press FC key invalid
13	communicate with FTP fail
14	prohibit to press cash key
15	prohibit to press credit key
16	prohibit to press check key
17	please clear account
18	password error
19	set time error
20	input barcode error
21	input date error
22	write FLASH error
23	prohibit to print daily report
24	50 PLU at 1 receipt at most
25	no hardware reset
26	barcode not yet download
27	NAND FLASH not exist or defective
28	waste book area full
29	password error
30	daily report not be cleared
31	PLU area will be full

32	input data error
33	this clerk no. has existed
34	clerk memory space full
35	invalid weight
36	ECR is on sale
37	cash in drawer overflows
38	super password error
39	cash in drawer is not enough
40	R/A amount overflows
41	P/O amount overflows
42	PLU is not found
43	sale price invalid
44	price error
45	PLU report overflows
46	fiscal ID must be 2 characters
47	fiscal ID& code have been set
48	fiscal code invalid
49	tax ID format error
50	tax ID has been set
51	tax ID error
52	writing fiscal memory failed
53	tax rate invalid
54	dept space is full
55	tax rate space is full
56	fiscal code error
57	fiscal memory full
58	write fiscal memory error (in z report)
59	ECR isn’t in fiscal mode
60	PLU can’t return
61	FM READ ONLY
62	printer no paper
63	printer 1 no paper
64	printer 2 no paper
65	member card input error
66	plomp command error
67	pay credit error
68	HARDWARE RESET ERROR
69	PLU recycle error
70	recycle index error
71	recycle unit price error
72	function error in recycle mode
73	no set fis code & num
74	no set tax ID
75	no set tax rate

76	fiscal memory was exchange
77	header can’t be set in fiscal mode
78	head message aren’t set ok
79	no FM or address or data bus short

6.2 System Error Information

Error code	Error description
1FE	device error

7 Data map

7.1 Daily Fiscal Data Map

Z1 Count	4 Digits	2 bytes(BIN)
Amount of Tax A	10 Digits	5 bytes(BIN)
Amount of Tax B	10 Digits	5 bytes(BIN)
Amount of Tax C	10 Digits	5 bytes(BIN)
Amount of Tax D	10 Digits	5 bytes(BIN)
Amount of Tax E	10 Digits	5 bytes(BIN)
Time(hour/minute)	4 Digits	2 bytes(BCD)
Reserve	6 Digits	3 bytes
Sales Total	10 Digits	5 bytes(BIN)
Date(Day/Month/Year)	6 Digits	3 bytes(BCD)
Fiscal receipt count	4 Digits	2 bytes(BIN)
Index of Tax rate table	2 Digits	1 bytes
Reserve	2 Digits	1 bytes
Check sum	2 Digits	1 byte

Total:45 bytes

7.2 Fiscal Memory Map

Start Address	***Content***	***Description***
00000	AA,55,AA,55	Fiscal identification flag bytes
00004	Reserve	
00300	Daily Fiscal Data (45)	Daily fiscal data, totally has 1830 daily fiscal data record. Every daily fiscal data needs 45 bytes, so 1830 * 45 bytes fiscal memory is occupied
144AE	Reserve	
1F650	Z Counter(2)	200 Recovery data, total 200 * (2+5) = 1400
	Time(hhmmDDMMYY)(5)	
1FBD0	Tax Rate(10)	30 Tax Rate, total 30*(10+2+5) = 510
	Z Counter(2)	
	Time(hhmmDDMMYY)(5)	
1FDDC	Header message	5 * 32 = 160
1FE7C	Reserve	
1FFC0	Mode flag	FF:Training mode, 5A:Fiscal mode
1FFC1	Fiscal mode set time (5)	Store the date of fiscal mode setting. (DDMMYY hhmm)
1FFC6	Reserve	
1FFD2	Decimal Position	0:w/o decimal, 2:decimal position = 2
1FFD3	Reserve	
1FFD8	Fiscal Code(2) & Number(10)	
1FFE4	Reserve	
1FFFC	'PECR'	Indicate Fiscal type

8 Element List

Printer Board

ITEM	QTY	DESCRIPTION	REFERENCE-DESIGNATOR
1	1	EPCRMMYLAB5040315A	PCB
2	1	MCRMC08PH04P15000	
3	1	MCR2C05FFC27P12500	JH2
4	1	220uF/16V	C20
5	2	47K/SMD0805	R126,R125
6	1	104/SMD0805	C18
7	2	DTC114EN3/SOT23	Q1,Q2
8	1	FFC18,180/1.0mm	J-TP201
9	1	O -30MM	

Display---shop

ITEM	QTY	DESCRIPTION	REFERENCE-DESIGNATOR
1	1	V=104/SMD0805	C1
2	1	V=PECRLCD	LCD1
3	2	V=LED-2	LED1,LED2
4	1	V=BC817-40	Q1
5	2	V=20R/SMD0805	R1,R2
6	1	V=1K5/SMD0805	R7
7	1	V=47K/SMD0805	R8
8	1	V=98L50/DICE1	U1

Display---client

ITEM	QTY	DESCRIPTION	REFERENCE-DESIGNATOR
1	1	V=104/SMD0805	C1
2	1	V=PECRLCD	LCD1
3	2	V=LED-2	LED1,LED2
4	1	V=BC817-40	Q1
5	2	V=20R/SMD0805	R1,R2
6	1	V=1K5/SMD0805	R7
7	1	V=47K/SMD0805	R8
8	1	V=98L50/DICE1	U1
9	1	V=JMP	J2
10	1	V=FFC10,180/1.0MM	CN2

ITEM	QTY	DESCRIPTION	REFERENCE-DESIGNATOR
1	1	V=EPCRMNPTMBC-041109B	PCB
2	1	V= radiator 12*6mm	

3	1	V=MS621/3.0V/4mA	BAT1
4	2	V=105/SMD0805	C1,BC1
5	1	V=47uF/35V	C10
6	3	V=220uF/10V	C13,C28,C29
7	1	V=101/SMD0603	C14
8	1	V=103/50V/MC/DIP	C15
9	1	V=470uF/10V	C19
10	1	V=220uF/16V	C20
11	1	V=2200uF/35V	C24
12	1	V=391/SMD0603	C26
13	2	V=1000uF/10V	C33,C35
14	1	V=10uF/10V	C37
15	1	V=47uF/35V/CDZ11	C38
16	2	V=5P/NPO/SMD0603	C40,C41
17	1	V=4.7uF/16V	C42
18	2	V=12P/SMD0603	C47,C48
19	9	V=102/SMD0603	
20	41	V=104/SMD0603	
21	1	V=CHOKE/330uH/0.3A	CK1
22	3	V=1N4148/SMD1206	D1,D3,D4
23	1	V=HBAT54C/SOT-23	D13
24	1	V=HBAT54A/SOT-23	D16
25	1	V=HBAT54/SOT-23	D17
26	3	V=1N4001/DO41	D2,D6,D7
27	3	V=1N5819/DO41	D8,D14,D15
28	1	V=HBAT54S/SOT-23	D9
29	2	V=3.15Amp/Slow	FUSE1,FUSE3
30	1	V=1.2Amp/Slow	FUSE2
31	28	V=1uH/SMD0805	
32	14	V=RH3.5X6X0.8	
33	3	V=G6H-06010051	L8,L14,L?
34	2	V=H2N7002/SOT23	Q1,Q18
35	2	V=HBA114ES6R/SOT363	Q11,Q28
36	1	V=HBC114ES6R/SOT363	Q12
37	1	V=HMBT3906/SOT23	Q15
38	1	V=PMOS/CEM4435/SOIC8	Q16
39	1	V=HSB772/TO126ML	Q17
40	1	V=HM772/SOT89	Q2
41	1	V=DTC114EN3/SOT23	Q23
42	1	V=DTA144EN3/SOT23	Q4
43	5	V=HMBT3904/SOT23	Q6,Q14,Q21,Q27,Q22
44	2	V=HM5551/SOT89	Q7,Q9
45	1	V=2SC2873Y/SOT89	Q8
46	1	V=1.8K/SMD0603	R?

47	1	V=7k5/SMD0603	R108
48	1	V=680R/SMD0603	R113
49	1	V=5K1/SMD0603	R12
50	5	V=100R/SMD0805	R13,R31,R94,R106,R107
51	3	V=510K/SMD0603	R17,R40,R93
52	1	V=30K/SMD0603	R20
53	1	V=8K2/SMD0603	R23
54	1	V=390R/SMD0603	R24
55	1	V=10M/SMD0603	R29
56	3	V=1K5/SMD0603	R3,R65,R67
57	1	V=442K/1%/SMD0603	R32
58	3	V=220R/SMD0603	R33,R43,R78
59	1	V=75R/SMD0805	R34
60	1	V=1K00/1%/SMD0603	R35
61	2	V=4K70/1%/SMD0603	R36,R45
62	3	V=1M/1%/SMD0805	R37,R60,R76
63	4	V=10K/SMD0603	R38,R46,R47,R54
64	1	V=7K50/1%/SMD0603	R44
65	6	V=47K/SMD0603	R5,R6,R30,R53,R59,R109
66	3	V=100K/1%/SMD0603	R51,R57,R58
67	1	V=270R/2W	R52
68	1	V=768K/1%/SMD0603	R55
69	3	V=1K/SMD0603	R61,R71,R112
70	2	V=27K/SMD0603	R62,R97
71	1	V=3R9/SMD0805	R66
72	2	V=1R/SMD0805	R68,R70
73	3	V=330R/SMD0603	R7,R9,R69
74	2	V=4K7/SMD0603	R72,R74
75	2	V=180R/SMD0603	R73,R98
76	1	V=10R/SMD0805	R75
77	1	V=22K/SMD0603	R77
78	1	V=150R/SMD0603	R773
79	2	V=910K/SMD0603	R79,R96
80	6	V=100K/SMD0603	R8,R10,R14,R21,R22,R99
81	1	V=62K/1%/SMD0603	R80
82	2	V=1M/SMD0805	R81,R82
83	2	V=470R/SMD0603	R84,R86
84	1	V=680K/SMD0603	R87
85	4	V=0R11/SMD0805	R88,R89,R100,R101
86	1	V=3K/SMD0805	R92
87	1	V=470R/SMD0603*4	RN1
88	2	V=10K/SMD0603*4	RN2,RN4
89	1	V=100R/SMD0603*4	RN3
90	1	V=SW3PIN/4.0mm	SWITCH1

91	1	V=74HCT164/SOIC14	U1
92	1	V=74AHC08/TSSOP14	U14
93	1	V=CD4066BC/SOIC14	U15
94	1	V=LM324/SOIC14	U16
95	2	V=LM393/SOIC8	U17,U30
96	1	V=BA6846VF/TSSOP14	U19
97	1	V=BS62LV1027SC/SOIC32	U2
98	1	V=KA34063A/SOIC8	U20
99	1	V=XC62FP3302PR/SOT89	U21
100	1	V=XC62GR5012PR/SOT895	U22
101	1	V=XC61CN5602MR/SOT23	U23B
102	1	V=XC62EP5002MR/SOT25	U24
103	1	V=HT1381/SOIC8	U26
104	1	V=XC6201P352PR/SOT89	U27A
105	1	V=74HCT32PW/TSSOP14	U28
106	1	V=HT7044A-1/SOT25	U29
107	1	V=98CP49/PQFP100	U3
108	1	V=EM78P451Q	U4
109	1	V=W29C020/PLCC32	U5
110	1	V=XC61CN4502MR/SOT23	U6
111	4	V=74AHCT273PW/TSSOP20	U7,U10,U11,U12
112	1	V=74LVC138/TSSOP16	U8
113	1	V=EPM3032ATC/TQFP44	U9
114	1	V=14M7456Hz/ZTT	X1
115	1	V=36M864Hz/ZTT	X2
116	1	V=32K768Hz	Y1
117	1	V=24V/0.5W/SMD1206	ZD1
118	1	V=3PIN/2.54MM	J5
119	1	V=CONN PCB 17x2	CN-IC1
120	1	V=DC-JACK/2.75MM	DC-IN1
121	1	V=EH02/90	CN-BZ1
122	1	V=FFC10,180/1.0mm	CN104B
123	1	V=FFC13,180/1.0mm	CN101
124	1	V=FFC27/180/1.00mm	J_MP205
125	1	V=PH02,90	J3
126	1	V=PH04,180	J4
127	1	V=PHONE4C	J1
128	1	V=PHONE6C	CN1
129	1	V=XH02.90	BATTERY
130	3	V=JMP	RAM-VCC1,J2B,J2A

9 IC Material

A.	98CP49	Main CPU
B.	EM78P451	Secondary CPU
C.	EPM3032ATC	Programmable Logic Device Family
D.	4066	Quad bilateral switch
E.	SN74HC138D	decoder
F.	SN74HC04D	Hex inverter
G.	SN74AHC08D	And gate
H.	Hcc4052b	analog multiplexers demultiplexers
I.	BSI1027	128K x 8 CMOS Static RAM
J.	AT27C040	OTP ROM
K.	HT1381	Serial timekeeper Chip
L.	KA34063	DC-to-DC Converter Control Circuit
M.	XC62EP	Boosting Voltage Regulators
N.	XC62FP5002	Boosting Voltage Regulators
O.	XC62FP3302	Boosting Voltage Regulators
P.	LM393	Low Power Low Offset Voltage Quad Comparators
Q.	74HCT164	8-Bit Serial-in/Parallel-out Shift Register
R.	SN74AHC273	OCTAL D-TYPE FLIP-FLOPS WITH CLEAR
S.	LM324	Quadruple Operational Amplifiers